

REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Status of Claims:

Claims 13 and 14 are currently being cancelled.

Claims 1, 2, 8-10, 12 and 19 are currently being amended.

Claims 22 and 23 are currently being added.

This amendment and reply adds, cancels and amends claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claims remain under examination in the application, is presented, with an appropriate defined status identifier.

After adding, canceling and amending the claims as set forth above, claims 1-12 and 15-23 are now pending in this application.

Claim Rejections – Prior Art:

In the Office Action, claims 1-6 and 8-11 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Publication No. 2003/0235974 to Martinez et al.; claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Martinez et al. in view of U.S. Patent Publication No. 2003/0020092 to Parikh et al.; claims 14 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Martinez et al. in view of U.S. Patent Publication 2001/0015446 to Inoue et al.; claim 15 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Martinez et al. in view of U.S. Patent No. 6,483,135 to Mizuta et al.; claims 16 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Martinez et al. and Mizuta et al. and further in view of U.S. Patent Publication No. 2001/0017370 to Sheppard et al.; claims 19-21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Martinez et al. in view of U.S. Patent Publication No. 2002/0043697 to Hirokawa; claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Inoue in view of Mizuta et al; and claim 13 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Inoue in

view of Mizuta and further in view of Martinez et al. These rejections are traversed with respect to the presently pending claims under rejection, for at least the reasons given below.

Independent claim 1 now recites “a channel layer made of $\text{In}_x\text{Ga}_{1-x}\text{N}$ ($0 \leq x \leq 1$) and an electron supply layer made of $\text{Al}_y\text{Ga}_{1-y}\text{N}$ ($0 < y \leq 1$)”.

In its rejection of claim 14, whereby the features of that claim have been incorporated into claim 1, the Office Action asserts that it is obvious to one of ordinary skill in the art to use a channel layer made of $\text{In}_x\text{Ga}_{1-x}\text{N}$ ($0 \leq x \leq 1$) and an electron supply layer made of $\text{Al}_y\text{Ga}_{1-y}\text{N}$ ($0 < y \leq 1$), in the field-effect transistor of Martinez, based on the teachings of Inoue.

However, one of ordinary skill in the art cannot combine the semiconductor layer structure of Inoue with the field-effect transistor of Martinez, as explained in detail below.

In Martinez, it was determined that a leak current occurred when a source region and a drain region are formed by an implantation process in a GaAs semiconductor FET (see paragraph 0015 of Martinez). In order to solve this problem, a cap layer is formed so that the cap layer does not overlap the source region and the drain region. As a result, the leak current paths between the source region and drain region of a GaAs semiconductor FET can be reduced. Considering the above-mentioned point, it is understood that the implant regions (the source region and the drain region) are essential features in the structure of Martinez. In other words, the structure of Martinez is a unique structure in a GaAs semiconductor FET that has implant regions.

On the other hand, the semiconductor FET of Inoue does not have any implant regions. Generally, in a GaN semiconductor FET, an implant region is not formed. In other words, the technology to form an implant region in a GaN semiconductor FET has not been established.

One of ordinary skill in the art would not replace the semiconductor layer of Martinez with a GaN semiconductor layer of Inoue that does not have an implant region, because the implant regions are essential features in Martinez and the structure of Martinez is a unique structure in the GaAs semiconductor FET that has implant regions.

Therefore, one of ordinary skill in the art would not combine Martinez and Inoue.

The inventors of the present invention found that it is difficult to maintain the compatibility between the collapse and the gate breakdown voltage in a GaN semiconductor FET, and as such have provided a GaN semiconductor FET which provides for excellent characteristics with respect to the balance between the collapse and the gate breakdown voltage by using the field-plate and using the insulating film that has a specific layer structure.

Both Martinez and Inoue do not teach or suggest that it is difficult to maintain the compatibility between the collapse and the gate breakdown voltage in a GaN semiconductor FET. Both Martinez and Inoue do not teach or suggest a structure to maintain the compatibility between the collapse and the gate breakdown voltage in a GaN semiconductor FET. Furthermore, Martinez and Inoue do not suggest that the multilayered film including films 71-73 of Martinez maintains the compatibility between the collapse and the gate breakdown voltage in a GaN semiconductor FET.

Accordingly, since Martinez and Inoue cannot be combined in the manner asserted in the Office Action, contrary to the assertions made in the Office Action, presently pending independent claim 1, as well as the other presently pending independent claims that have been amended in a similar manner, patentably distinguish over the cited art of record.

Still further, with respect to the rejection of claim 13, whereby the features of that claim have been incorporated into presently pending independent claim 12, Applicant submits that the rejection of that claim based on the combined teachings of Mizuta, Inoue and Martinez are incorrect.

In detail, the Office Action asserts that the multilayered film of Martinez improves device performance. However, there is no description that the multilayered film is provided to improve device performance in the structure of Martinez.

Also, the cross-sectional shape of the multilayered film of Martinez is different from that of the multilayered film of Mizuta, and there is no motivation to replace the multilayered film of Mizuta with the multilayered film of Martinez, since such a replacement would likely result in an inoperative structure, to one of ordinary skill in the art. Martinez describes a GaAs FET, and Martinez does not teach that a first insulating film containing silicon and

nitrogen is provided in order to decrease an influence of the surface negative charge in the GaN FET.

Furthermore, the multilayered film including films 71-73 of Martinez is used in order to form the gate opening 74 accurately (see paragraph 0036 of Martinez). On the contrary, in Mizuta, a film 4b is formed after a gate electrode 5 is provided (see Figure 6 of Mizuta). The gate opening is not formed in the film 4b in the structure of Mizuta. The multilayered film used to form the gate opening to the desired shape indicates the film 4b is formed after the gate electrode 5 is provided.

In addition, in Martinez, a TEOS layer 73, which is the uppermost layer, is used as an etch mask when the layer 72 and the layer 71 are etched. On the contrary, in Mizuta, the film 4b, which is the uppermost layer, is not used as an etch mask. Also, the function of the multilayered film of Martinez is different from that of Mizuta.

Therefore, there is no motivation to use the multilayered film of Martinez in the structure of Mizuta.

Accordingly, presently pending independent claim 12 is patentable over the cited art of record, for these additional reasons, beyond the reasons given above with respect to claim 1.

It is also noted that none of the other cited art of record rectifies the above-mentioned deficiencies of Martinez et al., whereby all of the presently pending claims under rejection patentably distinguish over the cited art of record, when taken as a whole.

New Claims:

New claims 22 and 23 have been added to recite additional features of the present invention that are believed to provide a separate basis of patentability for those claims, beyond the reasons given above for their respective base claims.

See Figures 1-20 of the drawings, for example, which show a field plate portion 5 having a visored shape *that overhangs a gate side of an insulating film between the gate electrode and the drain electrode and that does not overhang any part of the insulating film between the gate electrode and the source electrode.* Turning now to Martinez et al., Figure 7

of that reference shows a gate contact 75 that has a top portion that overhangs both a part of an insulating film between the gate contact and a source contact 65 and a part of an insulating film between the gate contact and a drain contact 66.

Accordingly, since Martinez et al. does not disclose or suggest a field plate portion 5 having a visored shape *that overhangs a gate side of an insulating film between the gate electrode and the drain electrode and that does not overhang any part of the insulating film between the gate electrode and the source electrode*, it cannot anticipate claims 22 and 23.

Conclusion:

Since all of the issues raised in the Office Action have been addressed in this Amendment and Reply, Applicants believe that the present application is now in condition for allowance, and an early indication of allowance is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. § 1.136 and authorize payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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